Bio-inspired *Zea mays* (corn) leaf three-dimensional scaffolds for human mesenchymal stem cell fate direction

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INTRODUCTION: Wide range of natural biomaterials including plant-derived scaffolds have been reported as suitable matrices for the three-dimensional culture of human tissues because of their biocompatibility, low cost, and mimicking the microenvironment of the cells. Especially, the topographical and chemical structure of plant leaves composed of lignin, cellulose, hemicellulose, and silica make an appropriate niche for bone regeneration.
AIMS: Present invention, evaluate the capability of the Zea mays leaf skeleton to support, grow, and differentiate the human mesenchymal stromal cells into osteocytes.
METHODS: First corn leaves were carefully washed with distilled water, cut into small pieces, and soaked in SDS solution. The samples were then treated to be thoroughly decellularized followed by physical and chemical assessment of obtained cellulosic scaffolds by SEM, TEM, FTIR, and NMR. The capability of corn leaves-derived scaffolds in providing 3D micro/nano-porous architecture matrices for culturing human stromal cells and directing cell fate were investigated.
RESULTS: Data of the surface roughness, hydrophilicity, mechanical properties, porous constructions, and lattice structures of the cellulosic scaffold revealed that it could be considered as a suitable and low-cost extracellular matrix for human tissue engineering. Further, it was found that the surface properties and the shape of scaffold pores were significantly stimulating the stem cells' binding, growth, and proliferation majorly for bone differentiation.
CONCLUSION: These findings suggest that the decellularized corn leaves can be considered as a promising potential 3D natural scaffold for use in human tissue regeneration.
Keywords: mesenchymal stromal cells, Corn leaf, Decellularization, bone regeneration

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